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Green Belt Team Success: Improved Reliability of the WSC-STGT Chiller Plant

On December 24, 2003, the Chiller Plant at the White Sands Complex-STGT reached a new operational milestone: one year without a failure. This milestone is significant because the Chiller Plant at the White Sands Complex has a long history of chiller failures. These failures have received attention over the years, but all the attention never led to increased reliability. That changed in the fall of 2002, when Facilities Operations Manager Art Corella made the Chiller Plant problems a Green Belt Project using Honeywell's Six Sigma Program to meet the challenge.

Commissioned in 1988, the Chiller Plant experienced a steady increase in building cooling load associated with growth in users and capability. The increases in building cooling load necessitated greater reliability of the chilled water system. However, the system was becoming less reliable. In 2001, the Chiller Plant experienced nine failures. The situation was precarious and even though the failures did not occur during the southwest desert region's high-temperature days, it was obvious that there was a significant problem. The reliability that directly affects the capacity of the Chiller Plant was in question and the local Facilities Operations section was pressed to find a solution. Intensive research was made of historic documentation to identify all failures. Historical data included reference to multiple failures and several attempts by the Facilities Operations section to contact vendors, architects, and design engineers in an effort to arrive at a definitive cause for the frequent failures. These attempts did not yield any positive results, and left the parties involved struggling with the next step to take toward a solution.

The Facilities Operations section then chose to procure the services of an independent engineering firm, one familiar with the southwest desert environment, to assist in the investigation. Unfortunately, this option proved too costly and had to be curtailed. However, in the interim the Chiller Plant supervisory control and data acquisition system was configured to collect data from key process points. To use this data effectively in resolving the reliabilty issue of the Chiller Plant, it was decided to use the Honeywell Six Sigma Program. A small Green Belt Team was formed to look at reliability issues and the cost associated with the repairs required to maintain a reliable system with adequate capacity and redundancy. The metrics were gathered from technical personnel on rotating shifts. The Green Belt Team used the Six Sigma tools to define the project and establish goals, measure and analyze the data, and then improve and control the process. Process maps were developed to fully understand all processes and critical process measurements were identified. Upper and lower specification limits for critical measurements were established from the manufacturer's documentation. These specification limits were later used to analyze the data retrieved from the chiller control system. Data was retrieved from historical documentation (logbooks and the Computerized Maintenance Management System) that identified the quantity and types of failures. All failure modes were identified and failure codes were assigned to each failure. These failure modes were then analyzed using a Fishbone Diagram. The Failure Mode and Effects Analysis (FMEA) tool was used to numerically rank all failure modes based on severity and detectability of each potential failure. Process improvements were identified and implemented based on the numerical ranking from the FMEA. A Control Plan was implemented that continues to monitor the process and re-evaluate the FMEA periodically to identify additional areas for improvement.

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